EPA Region 2 Clean Diesel Webinar Series

Webinar 1: Introduction to Clean Diesel Technologies and Strategies

September 22, 2009

National Clean Diesel Campaign

Introduction to Clean Diesel

- Why Clean Diesel?
- Diesel exhaust impacts
  - Air Pollution
  - Public Health Impacts
- Organized efforts – diesel collaboratives
- Technological solutions
- Successful strategies
- Opportunities for assistance

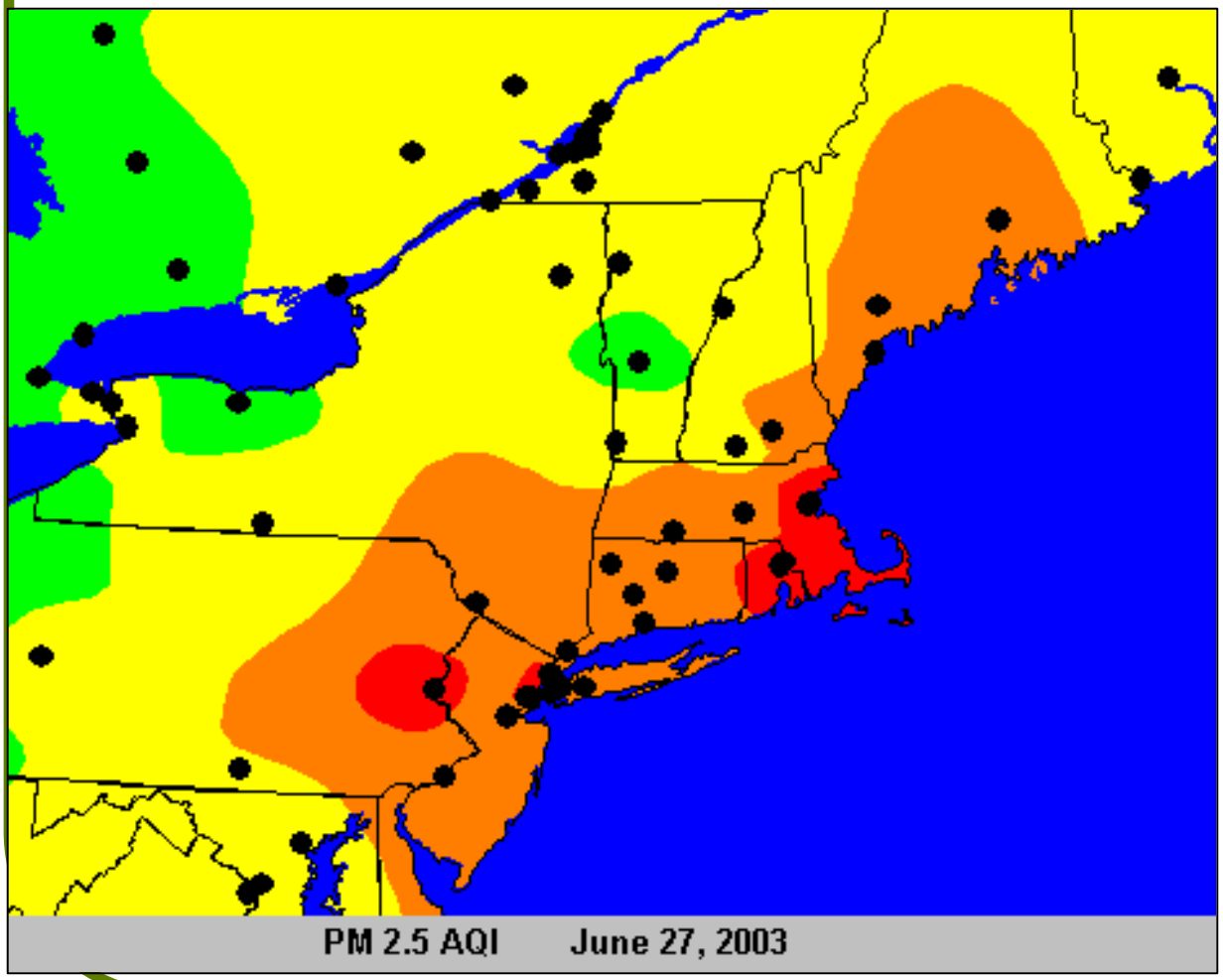
Why Clean Diesel?

- Reducing diesel emissions is one of our country's most important air quality challenges
- Diesel engines are the workhorses of the nation; millions of diesel engines already in use continue to emit large amounts of nitrogen oxides, particulate matter and air toxics
- These emissions are linked to premature deaths, asthma attacks, lost work days, and other health impacts every year

Pollutants in Diesel Emissions

- Oxides of Nitrogen
- Hydrocarbons
- *Ground level ozone*
- Particulate matter (PM)
- Hazardous air toxics
- Black carbon (climate change agent)

Unhealthy Levels of Pollutants in Diesel Exhaust Monitored Across the Region



Very Unhealthy

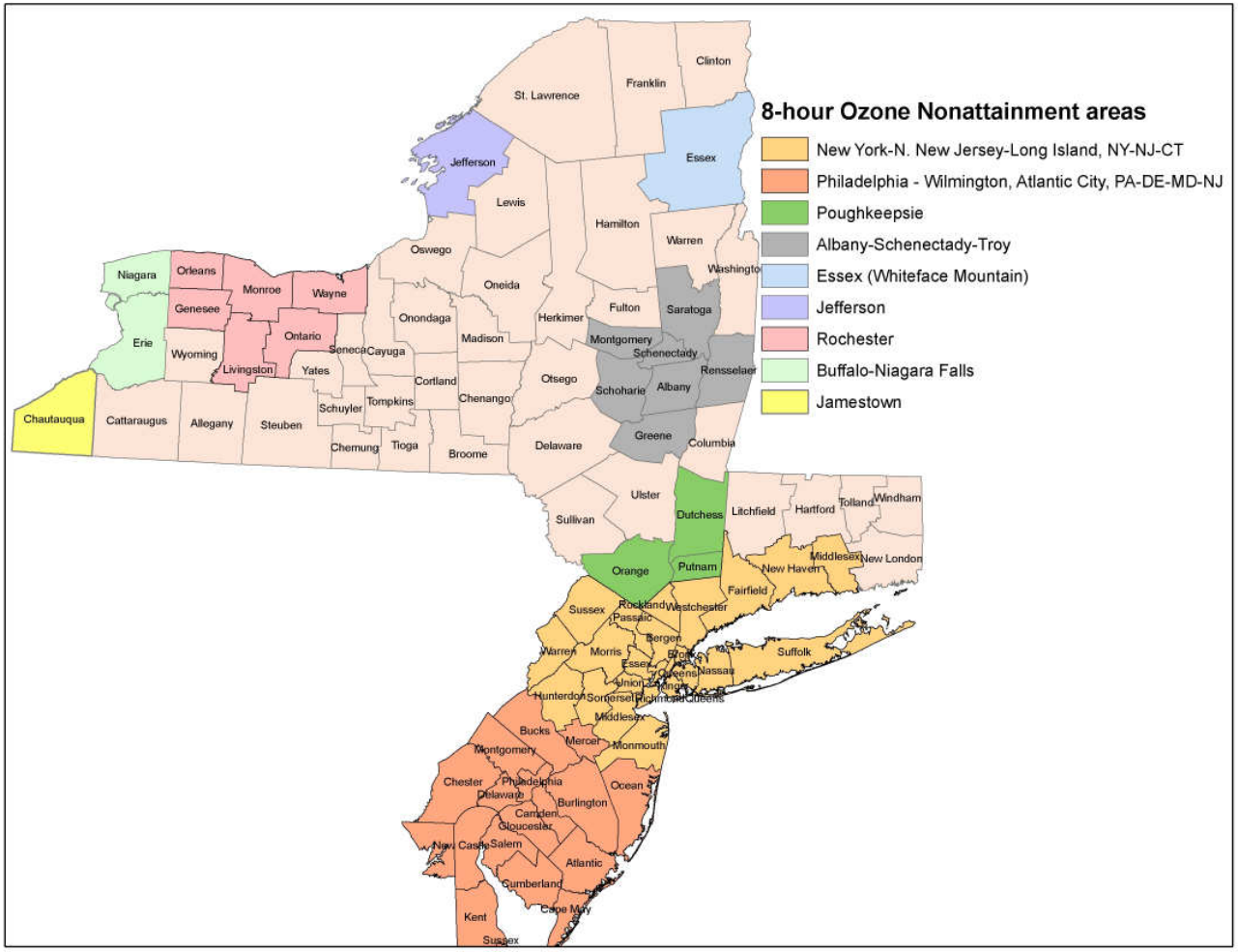
Unhealthy

Unhealthy for Sensitive Groups

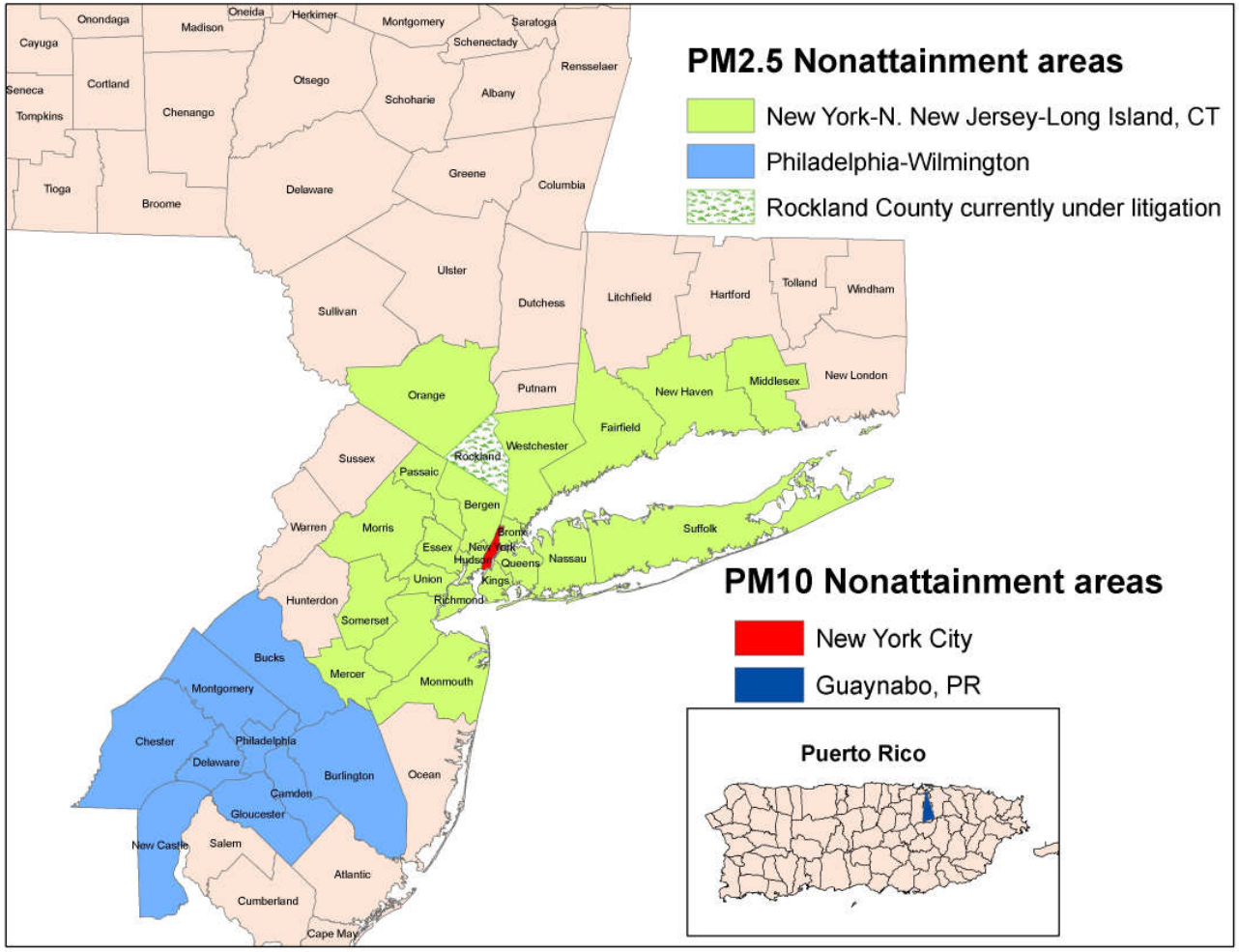
Moderate

Good

R2 Ozone Nonattainment Areas



R2 PM Nonattainment Areas



Diesel Exhaust: Health Effects

- Ground-level Ozone (Smog) and PM
  - Respiratory effects (lung irritation, difficulty breathing, etc.)
  - Increased incidence of asthma
- Particulate Matter (PM)
  - Cardiovascular effects (increased risk of heart attacks)
  - “Likely human carcinogen”
- Air Toxics
  - Increased cancer risk associated with prolonged exposure

About Particulate Matter

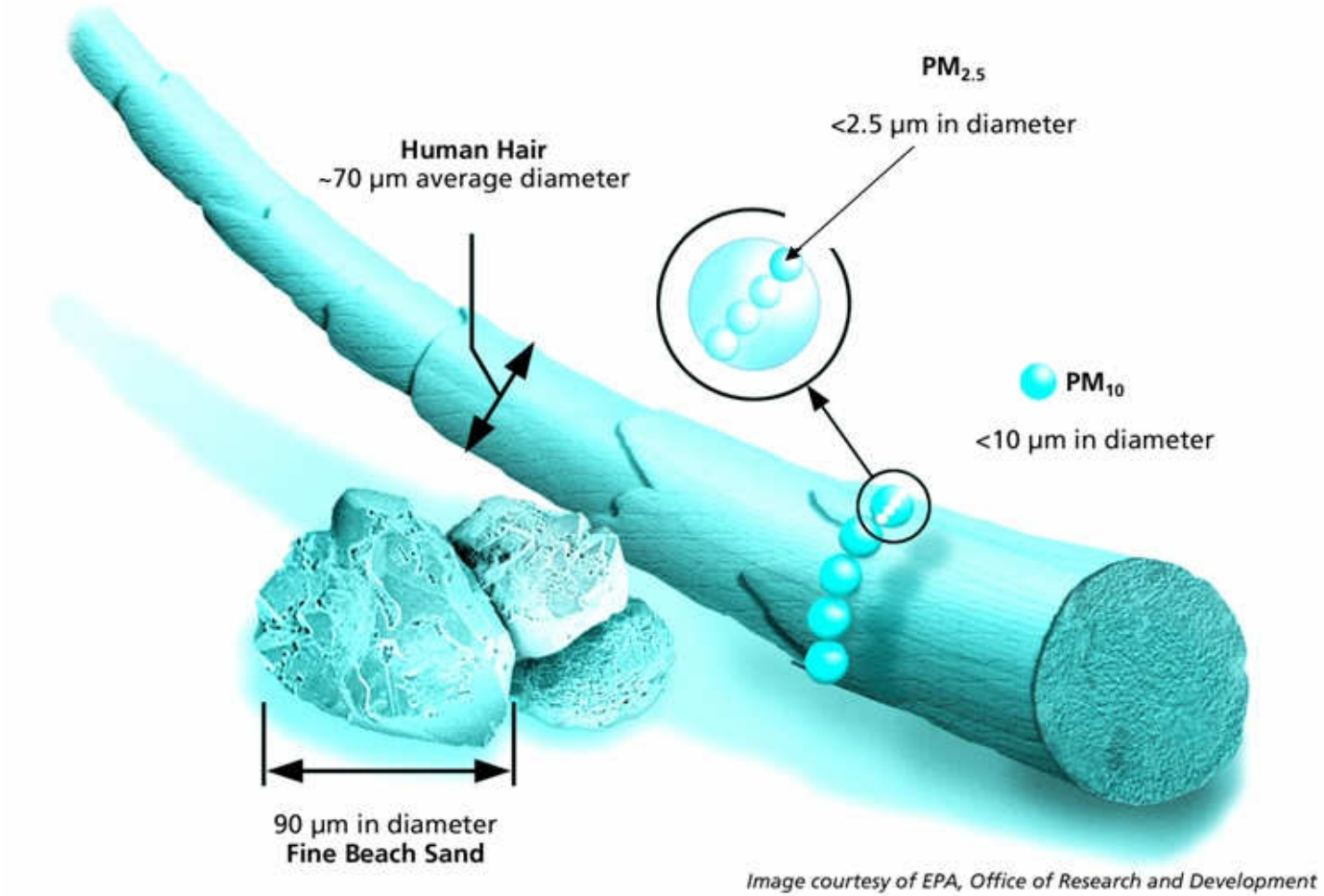
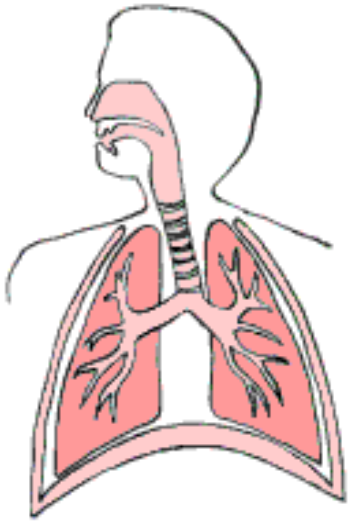
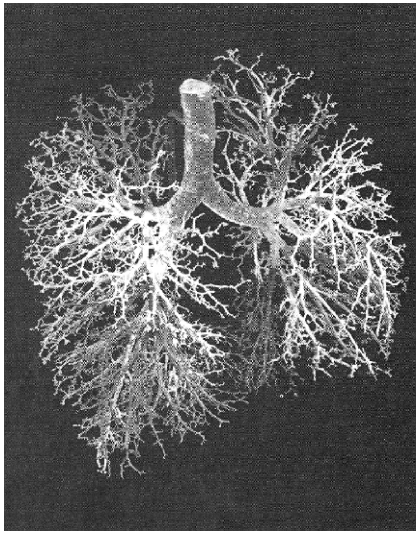


Image courtesy of EPA, Office of Research and Development

Particle Deposition

- Larger particles (> PM_{10}) deposit in the upper respiratory tract – (they are coughed out)
- Inhalable particles (< PM_{10}) penetrate into lungs



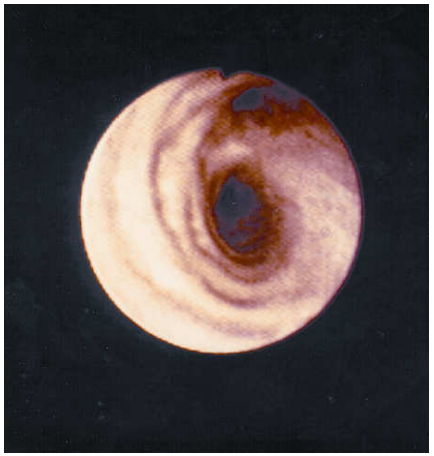


- Smaller particles may enter bloodstream by reaching to alveoli
- Particles may accumulate, react, be cleared or absorbed

particle size is an important characteristic

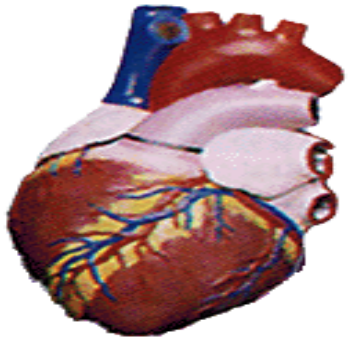
PM and Ozone Affect the Lungs …

- Respiratory system effects
  - Respiratory symptoms – irritation of airways, cough, phlegm
  - Decreased lung function
  - Airway inflammation
  - Asthma attacks
  - Chronic bronchitis
  - Lung cancer

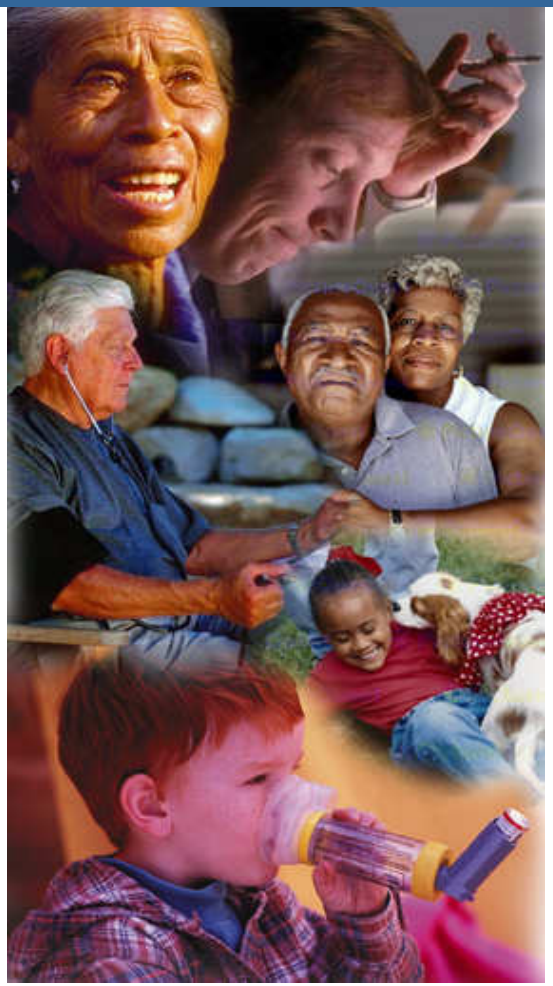


… and the Heart

- Cardiovascular system effects
  - Changes in heart rate and heart rate variability
  - Blood component changes
  - Cardiac arrhythmias
  - Heart attacks



Some Groups Are More at Risk



- People with heart or lung disease
- Older adults
- Children

Diesel Engines and Emissions

- Even with more stringent engine standards now taking effect, millions of in-use engines will continue to emit large amounts of pollution
- Pollution will continue to contribute to numerous instances of premature mortality, asthma attacks, lost work days and many other health impacts

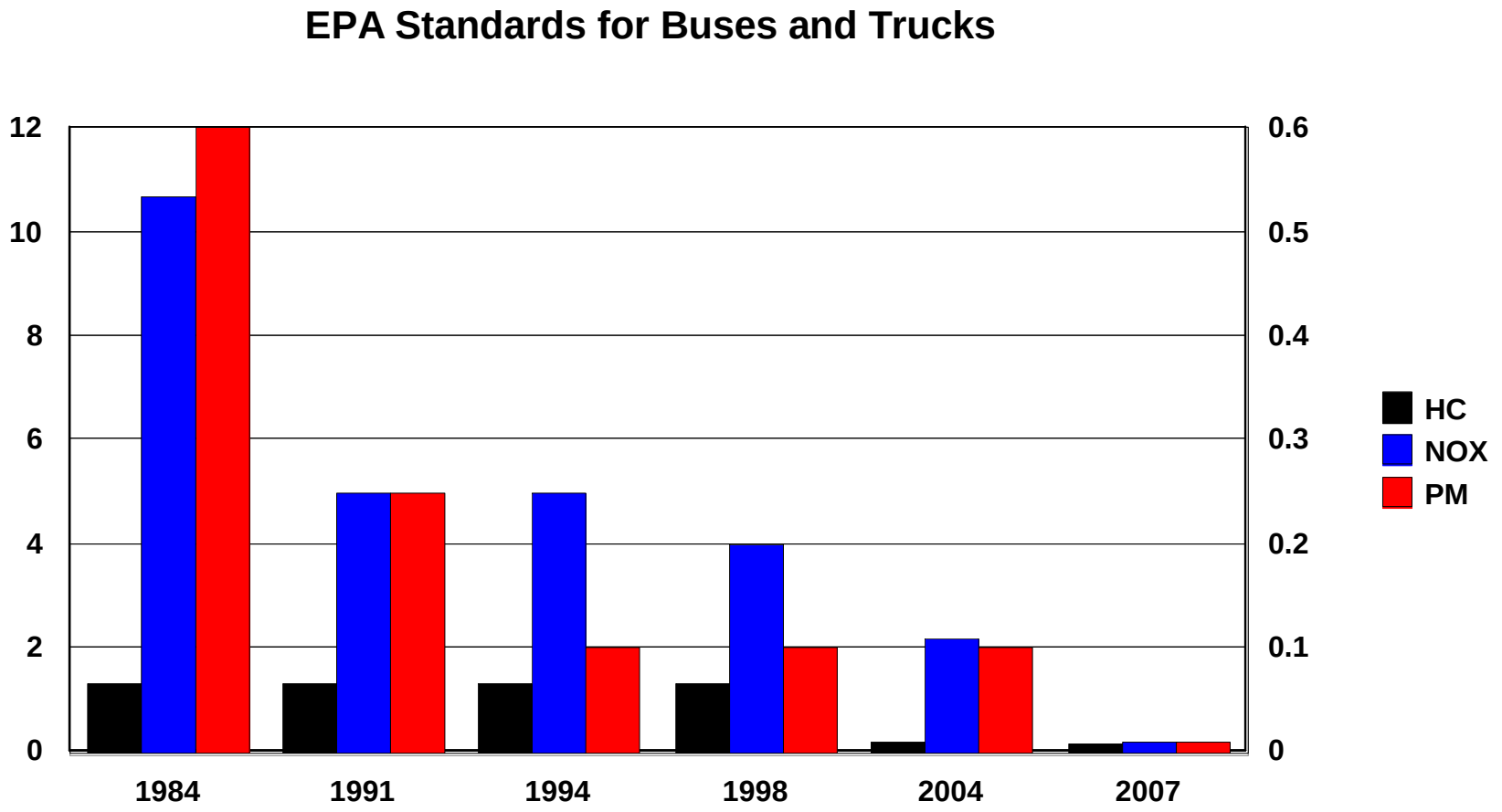
The Good News

- Cost-effective solutions are available now that bring immediate environmental and public health benefits

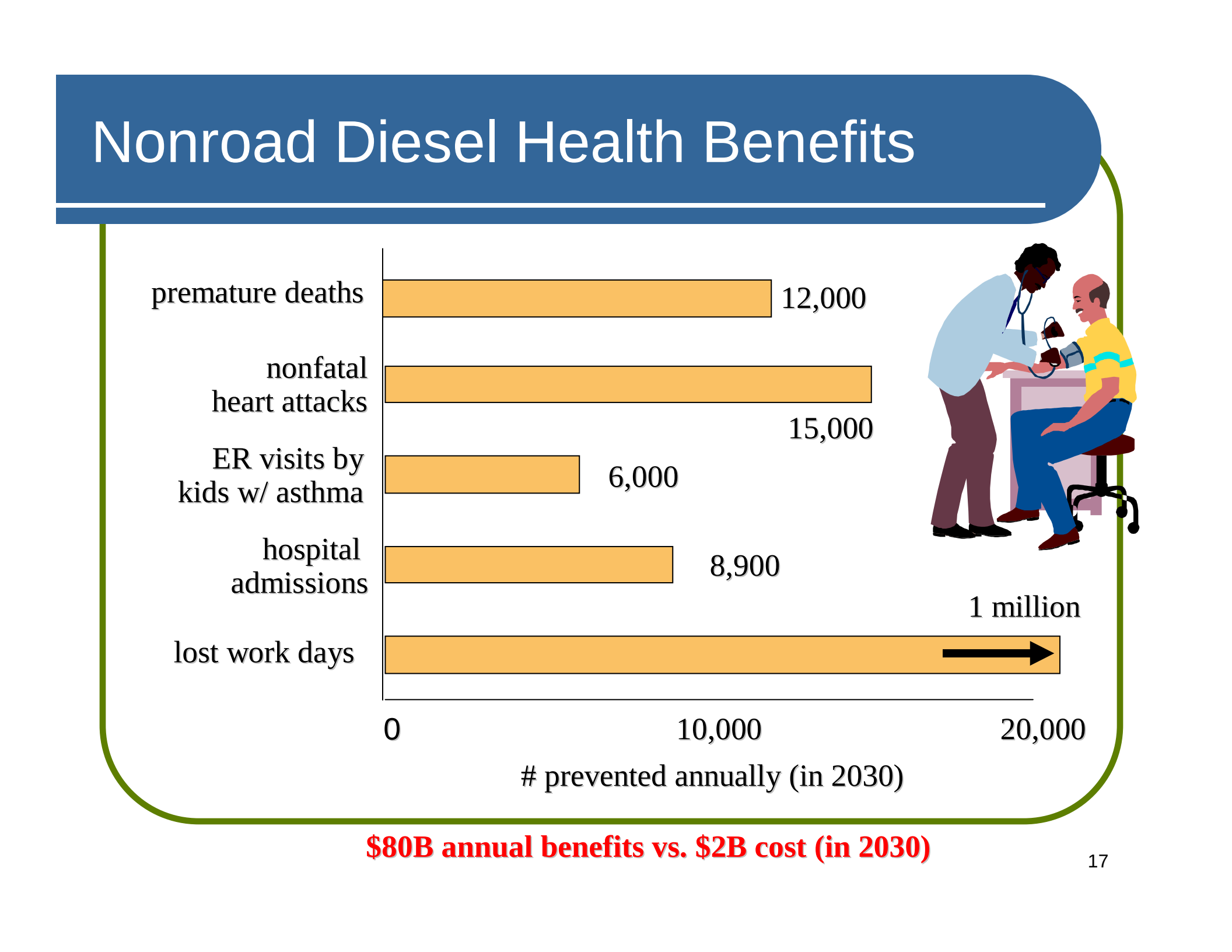
- Funding is available too
- How? EPA's Clean Diesel Programs

www.northeastdiesel.org

Strides in Clean Diesel Regulation



Nonroad Diesel Health Benefits



$80B annual benefits vs. $2B cost (in 2030)

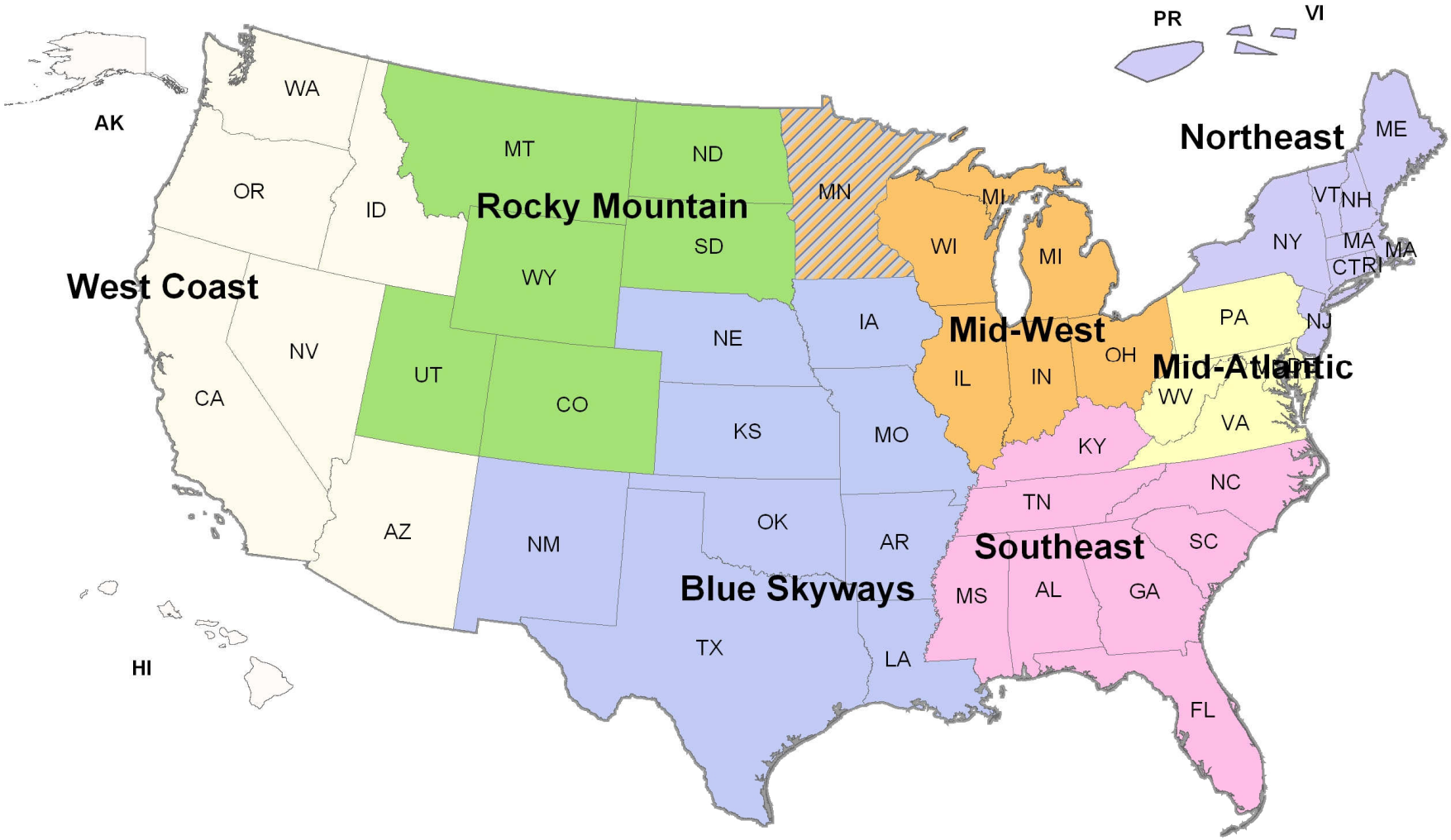
Why Diesel Retrofits?

- **Protecting Public Health**
  - Current clean diesel programs will reduce more than 20,000 PM tons over their lifetime providing billions of dollars in health benefits
- **Cost Effective Emissions Reductions**
  - Diesel retrofit can provide a benefit-to-cost ratio of up to 13:1
- **Nonroad retrofit can be some of the most cost effective**
  - For example, a typical bulldozer may emit as much PM as 500 cars
- **Broad Stakeholder Support**
  - Industry, government, community and environmental groups agree - cleaning up diesel emissions is important
  - Shared responsibility for clean air and public health
- **Implementation Advantages**
  - Diesel retrofits can be implemented quickly
  - Resources and leveraged funds available

EPA's Clean Diesel Collaboratives

- Seven regional collaboratives were formed to identify innovative, incentive-based emissions reductions.
- The collaboratives are diverse coalition of businesses, government, environmental groups and community organizations, industry, and others
- They have had great success in building partnerships, identifying sector goals and implementing projects.
- EPA's appropriated clean diesel funds are competed and awarded by the seven Regional Collaboratives through grants to local communities.

Regional Clean Diesel Collaboratives



Regional Collaborative Websites

- Northeast Diesel Collaborative (Regions 1, 2)
  - http://www.northeastdiesel.org/
- Mid-Atlantic Diesel Collaborative (Region 3)
  - http://www.dieselmidatlantic.org/diesel/index.htm
- Southeast Diesel Collaborative (Region 4)
  - http://www.southeastdiesel.org/
- Midwest Clean Diesel Initiative (Region 5)
  - http://www.epa.gov/midwestcleandiesel/
- Blue Skyways Collaborative (Regions 6, 7 plus Minnesota)
  - http://www.blueskyways.org/
- Rocky Mountain Clean Diesel Collaborative (Region 8)
  - http://www.epa.gov/region8/air/rmcdc.html
- West Coast Collaborative (Regions 9, 10)
  - www.westcoastcollaborative.org/

Successful Clean Diesel Strategies

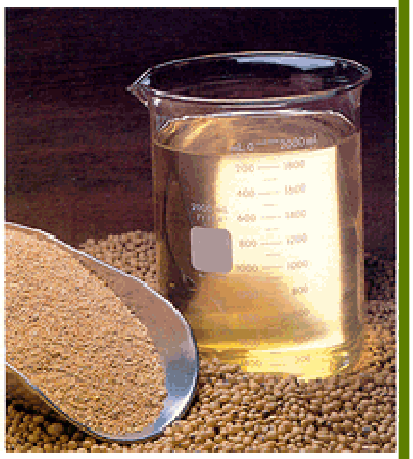
- Fuel-based
  - Ultra low sulfur diesel
  - Biodiesel
- Technology-based
  - Catalysts
  - Filters
  - Replace Engine/vehicle
  - Idling Reduction
- Maintenance

Ultra low sulfur diesel fuel

- 15ppm sulfur
- Current standard highway fuel = widely available
- Off-road standard in 2010 (currently 500 ppm)
- Reduces PM without any other technologies

Biodiesel Fuel

- Animal or vegetable oils
- Often blended with regular diesel (B5, B20)
- Reduces PM
- ASTM D-6751
  - Several engine manufacturers have stated that blends up to B20 that conform to ASTM D-6751 will not void engine warranties



- NJ and NY state policies promote biofuels through tax credits, blending subsidies

Diesel Oxidation Catalyst (DOC)

- Catalyzed reduction of soluble diesel PM fraction
- 20% PM reduction
- Up to 40% reduction in VOC
- Relatively low cost (under $2,000)
- Bolt-on replacement
- Little to no maintenance

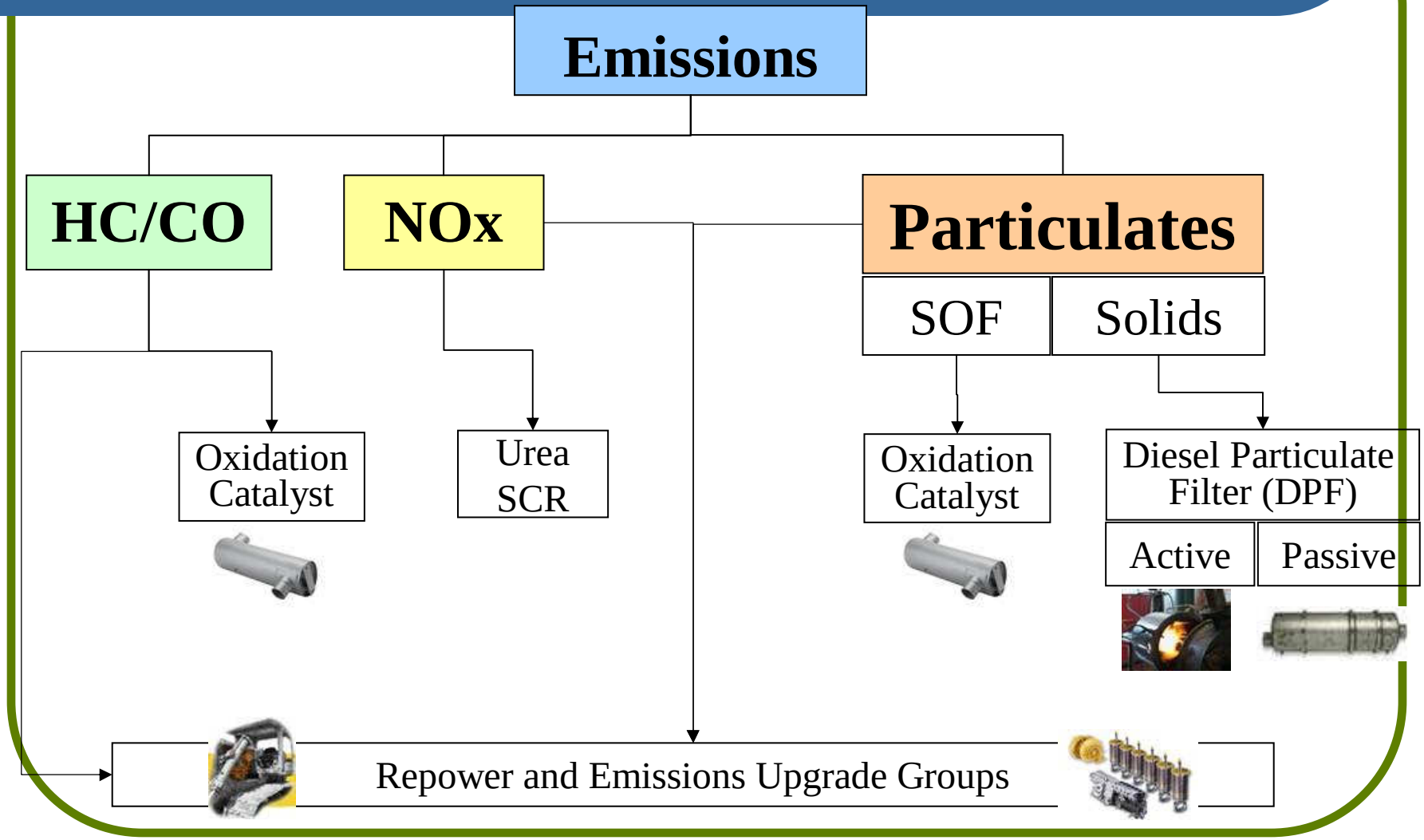
Diesel Particulate Filter (DPF)

- Mechanically filters particles
- 90% PM reduction
- 90% VOC reduction
- ≈ $7,000-$12,000*

*maybe more, depending on the amount of custom engineering

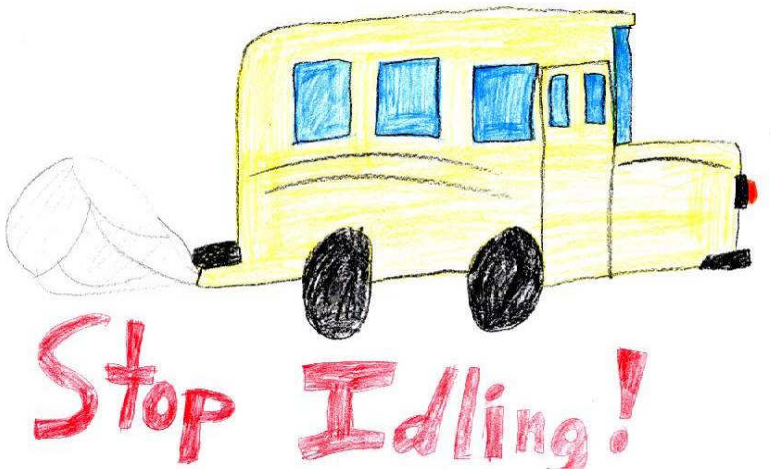
- Requires ULSD
- Passive or Active
- Some maintenance required

Potential Retrofits

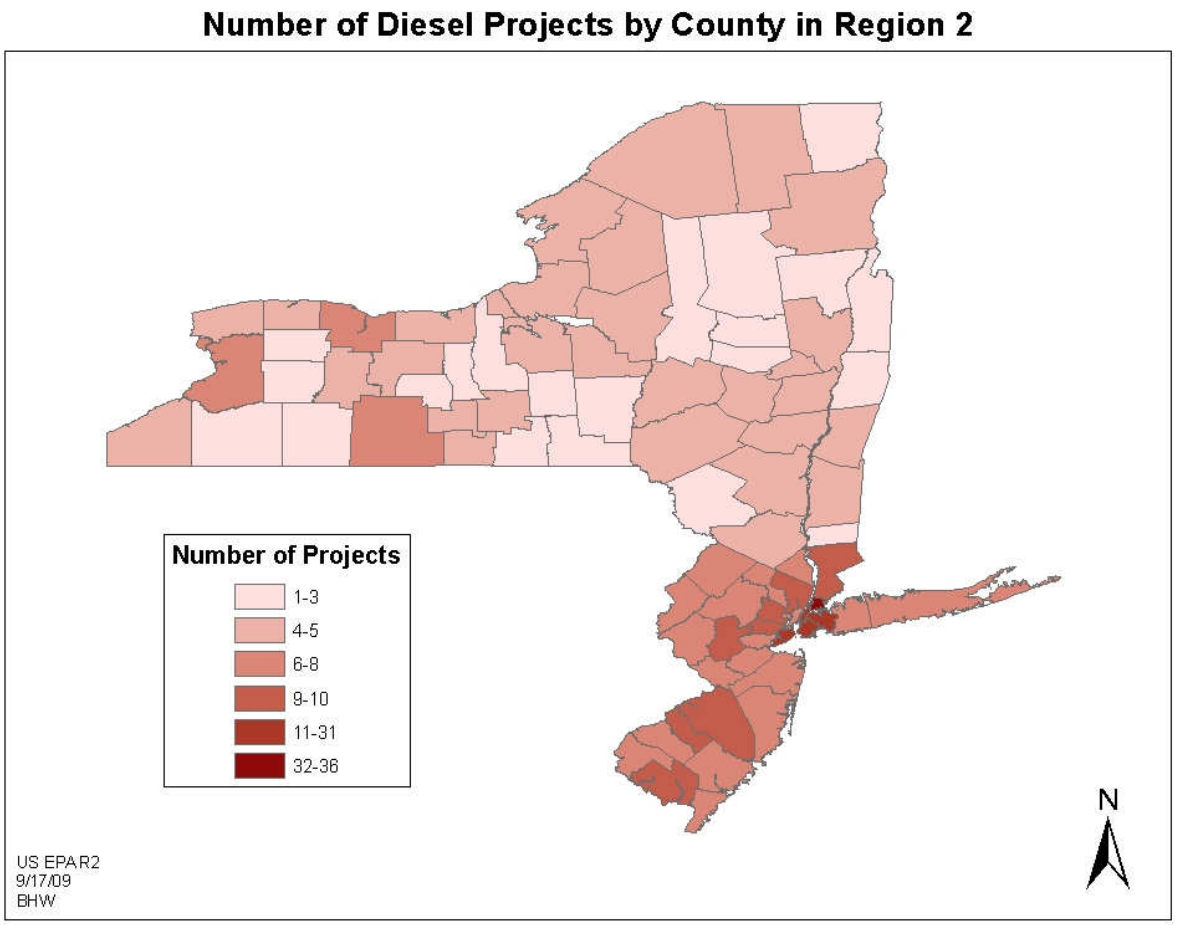


Idling Reduction & Preventative Maintenance

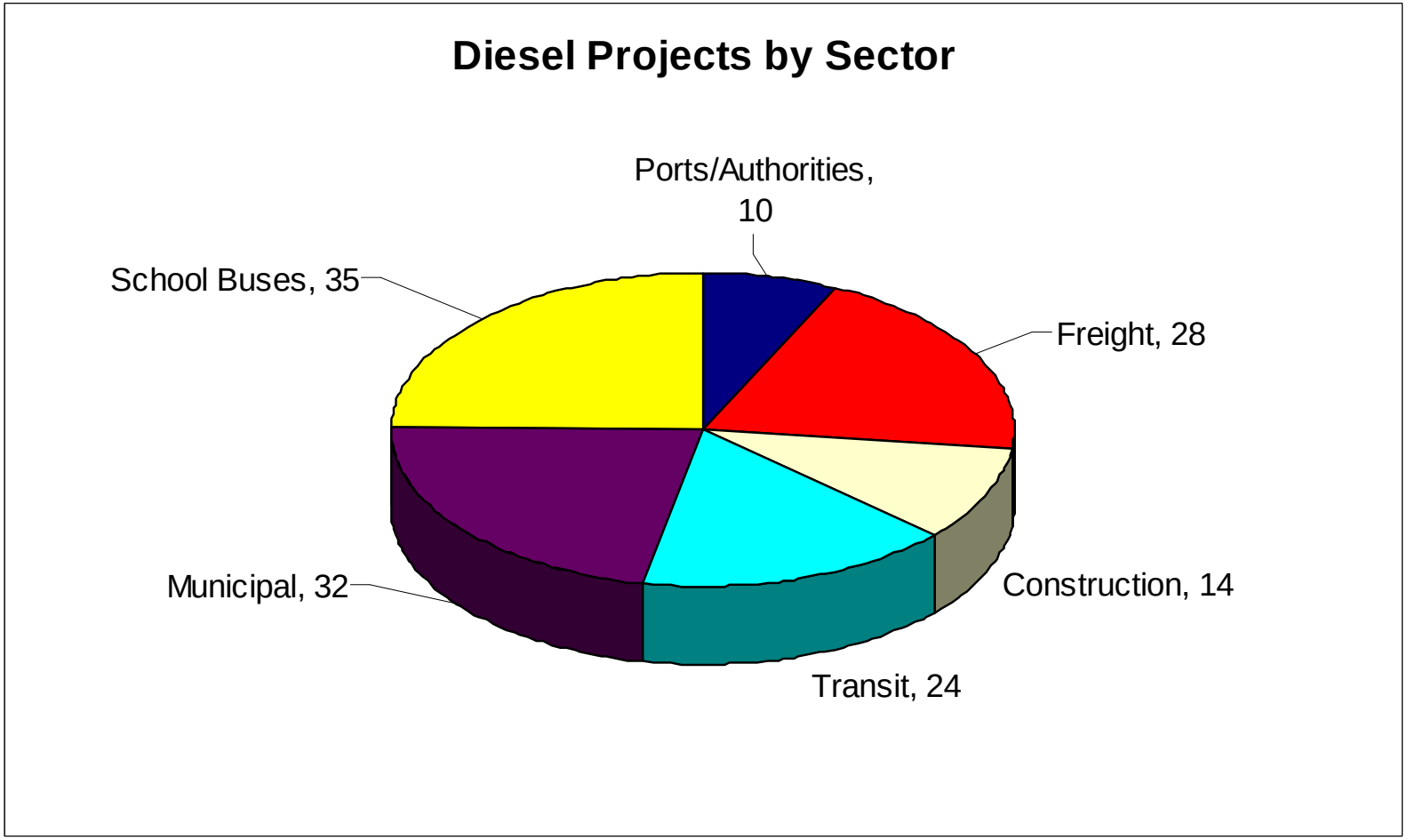
- Simple
- Cost-effective
- Myths about idling diesel engines have been debunked



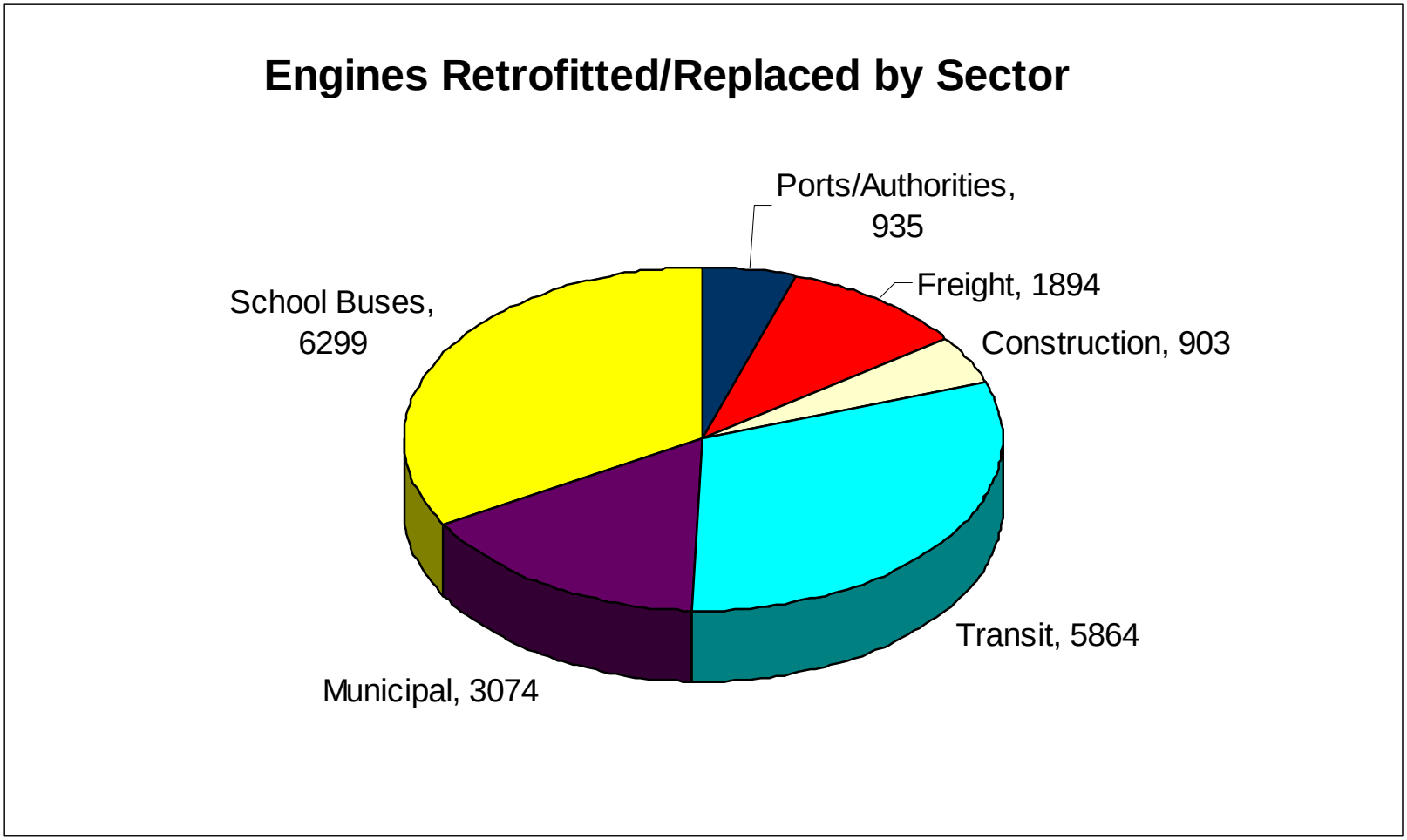
Clean Diesel Successes



Priority Sectors



Priority Sectors, Continued



Why Clean Diesel - Summary

- Addressing pollution from diesel engines is a high priority challenge
- Numerous health threats to high risk groups
- Cleaning existing diesel engines is a proven, cost effective strategy
- Assistance is here for you!
  - Expertise
  - $$$

Contact Information

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